

The Personnel Entry

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I. Introduction

The personnel entry is a transition zone between the dirty conditions of the entrance drift and the clean conditions of the laboratory. The personnel entry and the procedures for using it must prevent mine dust and other contamination from entering the laboratory. The personnel entry must not only keep out mine dust, however, workers must be able to pass through it rapidly in order to maximize productivity.

The extremely dusty, dirty conditions existing over the 1.5 km long walk from the elevator shaft to the SNO entrance ensure that everyone approaching the entrance of the laboratory will have substantial amounts of mine dust on their clothes, skin, and hair. Although mine dust contains, by everyday standards, minuscule amounts (a few parts per million) of uranium and thorium, these tiny amounts of radioactive material pose a most serious contamination problem for the SNO detector. Cleanliness, therefore, like safety, is a consideration that must be kept constantly in mind.

II. The Facility

The personnel entry provides space and facilities for taking off and storing outer clothes worn in the drift, for showers, and for putting on clean clothes for work in the laboratory. At a shift change, as many as 25 workers may need to pass through the

personnel entry in a short time. A typical number, however, would be 15. In addition there will be occasional visitors. The personnel entry must be designed so that workers proceeding through simultaneously do not cross-contaminate each other.

A layout of the personnel entry is shown in Fig.1. The personnel entry extends from the boot bath at the entrance of the laboratory to the air showers at the entrance to the corridor junction. The elements are:

1. a boot bath for removal of heavy mud and dust from rubber boots,
2. an equipment and boot-removal area,
3. an area for removing and storing mine coveralls and underwear,
4. wet showers and a drying area,
5. an area for storing and putting on clean clothes, and
6. an air shower.

Elements 1, 2, and 6 are common for both sexes. Elements 3, 4, and 5 exist on two levels and may be used separately by men and women. The (dirty) storage area for mine equipment and mine clothes accommodates 20 persons in the downstairs area and 10 persons in the upstairs area. The storage capacity on the clean side of the entry (for clean shoes, a few personal effects) can handle 90 people.

III. Procedure

1. After passing the security entrance, workers walk through the boot bath, which removes gross amounts of mud and dust. There are mats for wiping feet just before and after the entrance door.
2. Helmets, safety belts and any other detachable equipment are hung on the hooks along the wall just inside the door.
3. Boots are removed while sitting on the first bench. After the boots are off, the person swings his or her legs over the bench onto the dirty-garment side. (Note that a person does not put his feet down on the entrance side of the bench after taking off the boots.

This prevents cross contamination by "back-tracking." Removed boots can be placed in the storage baskets afterward by the custodian.)

4. With feet clad in socks, a worker proceeds to the next bench where he removes the mine coveralls and all other clothes. Baskets and hooks are available for storage.

5. After removing his socks, the worker swings his legs over the bench onto the wash-area side and proceeds to the shower. The worker's lunch pail and clean work clothes (carried in a clean plastic bag by the worker, see below) are passed around the shower to the drying area.

6. The worker takes a shower, dries off, and proceeds to the clean garment area where clean work clothes are put on. Individual baskets for storage of clean work shoes, clean underwear, small personal items, etc. are provided on the clean-garment side.

7. After exiting the clean garment area, the worker picks up his hard hat and proceeds to the air shower. The worker puts on eye protection and, after stepping on the tacky mats, enters the air shower, which removes larger particles of dust and lint from clothes. Whenever workers leave the corridor junction, e.g., for the lunch room or toilets, they use the air shower on return to the corridor junction.

8. At the end of the shift, the procedure is reversed, with the exception that the wet showers are bypassed.

9. Workers going off and coming on shift cross paths at the surface.

Lunch pails, a change of clean coveralls and underwear, and other (small) items best carried down by the worker may be brought through the personnel entry in the following way. SNO provides a standard plastic double bag into which the lunch pail and other items are placed when the worker is in the above-ground change room and before he comes in contact with mine coveralls and equipment. He carries this double bag with him in the elevator cage and along the drift. Just as he is ready to leave the dirty garment area to take a shower, he removes the outer bag and leaves it with his other clothes in the dirty-garment area. The unopened clean inner bag is passed over the rope barrier into the drying area, bypassing the wet shower.

After showering the worker carries the clean bag into the clean garment area, removes the contents and leaves it in his basket. He leaves his lunch pail in the lunch room. At the end of the shift, clean work shoes are left in the worker's basket, the lunch pail and used clean coveralls are placed in the clean bag while still in the clean area, the clean bag is placed in the dirty bag while in the dirty-garment area, and both bags are carried to the surface. After exiting the surface change area, the dirty bag is discarded.

The details of the above procedures may be modified as experience is gained in using the personnel entry.

IV. Impact of Procedures

Procedures followed by personnel in the transition from dirty to clean conditions impact the construction time. The following table gives an estimate of how much time it should take a worker (e.g., a SNO employee) to go through the personnel entry at the start of the shift provided that he does not have to wait for a person ahead of him to make space available. The numbers in the table are estimates of what can be achieved with training and practice. The "capacity" at each stage is the number of people who can engage in that operation simultaneously. More accurate estimates will be possible as experience is gained.

Table 1

<u>Operation</u>	<u>Time</u> (min)	<u>Capacity</u> (people)	
gear removal	0.5	9	
boot removal	0.5	7	
dirty-garment area	2	<u>downstrs</u> 10	<u>upstairs</u> 5
shower	3	5	2
drying area	1.5	5	2
clean-garment area	3	9	5
air shower	0.5	2	

The time to go through the personnel entry is thus 11 minutes if there is no waiting. The corresponding time at the end of the shift is shorter by 4.5 minutes because no shower is taken.

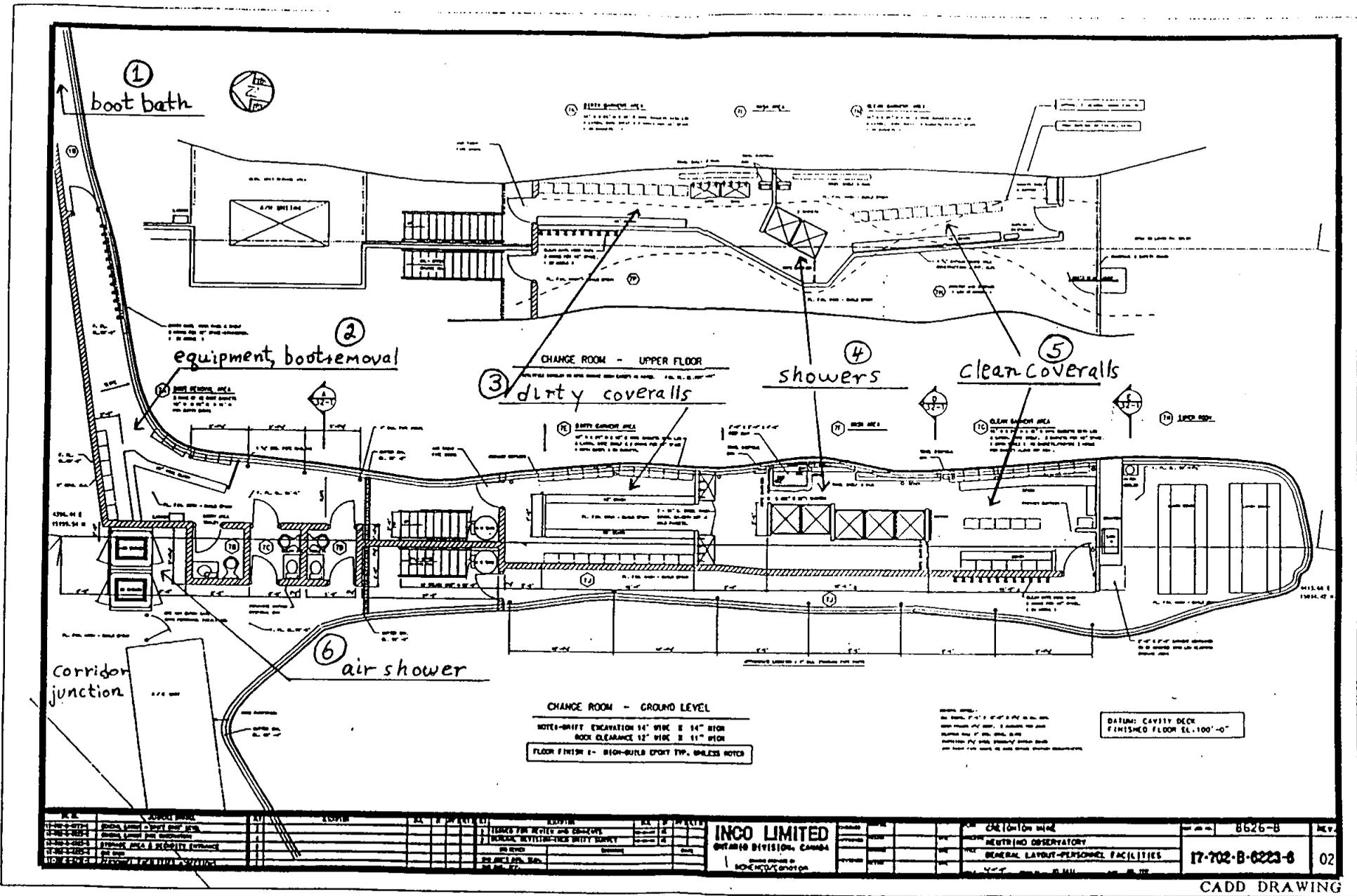
The total time in man hours expended in the personnel entry on entering and exiting, for a 3 minute shower and including time spent in waiting, are summarized in Table 2. The numbers in parenthesis give the percentage of the time in the entry that is expended in waiting. In making these estimates, it was assumed that both downstairs and upstairs facilities could be used without regard to gender.

Table 2

	<u>15 person shift</u>		<u>25 person shift</u>	
	(man-hours)	(% waiting)	(man-hours)	(% waiting)
entering	3.2	(14%)	6.2	(26%)
exiting	1.5	(3%)	3.0	(15%)
total pers. entry	4.7		9.2	

The average time spent per worker in the personnel entry is calculated as follows: $4.7 \times 60/15 = 19$ min. for a 15 person shift, and $9.2 \times 60/25 = 22$ min. for a 25 person shift.

Training in cleanliness procedures and in efficient use of the personnel entry will have to be a part of the employee's general training in preparation for working underground.



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NEUTRON OBSERVATORY
 GENERAL LAYOUT-PERSONNEL FACILITIES

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CADD DRAWING

Fig. 1